UNIVERSITI SAINS MALAYSIA

First Semester Examination
Academic Session 2008/2009

November 2008

EBB 332/4 – Whiteware and Glasses
[Tembikar dan Kaca]

Duration : 3 hours
[Masa : 3 jam]

Please ensure that this examination paper contains NINE printed pages before you begin the examination.
[Sila pastikan bahawa kertas peperiksaan ini mengandungi SEMBILAN muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]

This paper contains THREE questions from PART A and FOUR questions from PART B.
[Kertas soalan ini mengandungi TIGA soalan dari BAHAGIAN A dan EMPAT soalan dari BAHAGIAN B.]

Instruction: Answer **TWO** questions from **PART A**, **TWO** questions from **PART B** and **ONE** question from any part. If candidate answers more than five questions only the first five questions answered in the answer script would be examined.
*[**Arahan**: Jawab **DUA** soalan dari **BAHAGIAN A**, **DUA** soalan dari **BAHAGIAN B** dan **SATU** soalan dari mana-mana bahagian. Jika calon menjawab lebih daripada lima soalan hanya lima soalan pertama mengikut susunan dalam skrip jawapan akan diberi markah.]*

Answer to any question must start on a new page.
[Mulakan jawapan anda untuk setiap soalan pada muka surat yang baru.]

You may answer a question either in Bahasa Malaysia or in English.
[Anda dibenarkan menjawab soalan sama ada dalam Bahasa Malaysia atau Bahasa Inggeris.]

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PART A / *BAHAGIAN A*

1. [a] Describe the chemical and physical reaction that occur when hemihydrate (plaster of paris) is added to water.

Terangkan tindakbalas kimia dan fizikal yang berlaku ketika hemihidarat (plaster paris) ditambah ke dalam air.

(30 marks/*markah*)

[b] 2 (Two) ratios of water to plaster (P.O.P) are used to make different types of whiteware moulds, XM and YM as shown below:

Mixture	Water (ml)	P.O.P(g)
XM	100	120
YM	150	110

Discuss the possible properties expected of moulds XM and YM respectively. Based on the properties discussed, indicate their potential application.

2 (Dua) nisbah air ke plaster (P.O.P) digunakan untuk hasilkan acuan tembikar putih yang berbeza, XM dan YM seperti berikut:

Campuran	*Air (ml)*	*P.O.P(g)*
XM	*100*	*120*
YM	*150*	*110*

Bincangkan sifat-sifat yang mungkin terhasil daripada acuan XM dan YM masing-masing. Berdasarkan sifat-sifat yang dibincangkan, apakah potensi kegunaannya.

(40 marks/*markah*)

[c] New moulds typically faces defects such as cracks, sticking to mould and peeling. Discuss why these defects occur and how to minimise the problem.

Acuan-acuan baru lazimnya berhadapan dengan kecacatan seperti, retakan, pelekatan pada acuan dan umpilan. Bincangkan mengapa kecacatan-kecacatan ini berlaku dan bagaimana masalah ini dapat diminimakan.

(30 marks/*markah*)

2. [a] Explain viscosity and thixotropy in slip for casting of sanitaryware. How are they controlled? How are these properties determined? How would thixotropy influence slip casting?

Terangkan kelikatan dan tiksotropi dalam slip untuk tuangan tembikar sanitari. Bagaimanakah kedua-duanya dikawal? Bagaimana sifat kedua-duanya ditentukan? Bagaimana tiksotropi mempengaruhi tuangan slip?

(40 marks/*markah*)

[b] Explain why minimum viscosity is not required for good casting.

Terangkan mengapa kelikatan minima tidak diperlukan untuk tuangan yang baik.

(30 marks/*markah*)

[c] Describe hollow casting, battery casting and pressure casting.

Perihalkan tuangan lohong, tuangan bateri dan tuangan tekanan.

(30 marks/*markah*)

3. [a] In plastic forming of tablewares, workability of the raw body is a major influence on the quality of the product. Based on strain rate-stress diagram, explain workability. Discuss 2 factors influencing workability.

Dalam pembentukan plastik, kebolehkerjaan jasad anum adalah satu pengaruh utama ke atas mutu hasilan. Berdasarkan rajah kadar terikan-tegasan, terangkan kebolehkerjaan. Bincangkan 2 faktor mempengaruhi kebolehkerjaan.

(40 marks/*markah*)

[b] With schematic drawings, describe the jolleying and rollerhead process.

Dengan bantuan lakaran skematik, terangkan penjelukan dan sumbur reroda.

(30 marks/*markah*)

[c] Discuss the effect of shapes of granules and level of moisture content in granules in dry pressing of floor tiles.

Bincangkan kesan bentuk granul dan paras kandungan lengasan dalam granul dalam penekanan kering ubin lantai.

(30 marks/*markah*)

PART B / *BAHAGIAN B*

4. [a] Discuss the composition of a glass based on the modern theory of glass formation.

Bincangkan komposisi sesuatu kaca berasaskan teori moden pembentukan kaca.

(30 marks/*markah*)

[b] What are the functions of the following oxides when added to a glass composition:

(i) Al_2O_3

(ii) SrO

(iii) B_2O_3

Apakah fungsi oksida berikut bila ditambah ke dalam komposisi kaca:

(i) Al_2O_3

(ii) SrO

(iii) B_2O_3

(30 marks/*markah*)

[c] Discuss what is meant by glass melting.

Bincangkan apa yang dimaksudkan dengan peleburan kaca.

(40 marks/*markah*)

5. [a] Describe how thermal stresses are set up in glass products, as opposed to other solids, during manufacture.

Bincangkan bagaimana tegasan terma diwujudkan dalam hasilan kaca sewaktu penghasilan berbanding dengan pepejal lain.

(40 marks/*markah*)

[b] How are these stresses relieved in actual industrial practice.

Bagaimanakah tegasan ini disingkirkan dalam amalan amalan industri sebenar.

(20 marks/*markah*)

[c] Describe one process each to form a sheet glass and a container glass.

Perihalkan suatu proses penghasilan kaca keping dan juga kaca bekas.

(40 marks/*markah*)

6. [a] Figure 1 is a ternary phase diagram for a $MgO-Al_2O_3-SiO_2$ system. Describe the cooling of a melt X by noting the following:

(i) the original composition of X

(ii) the earliest temperature when crystallization will occur in the melt

(iii) the first phase that will crystallize out

(iv) the final crystalline phases at room temperature

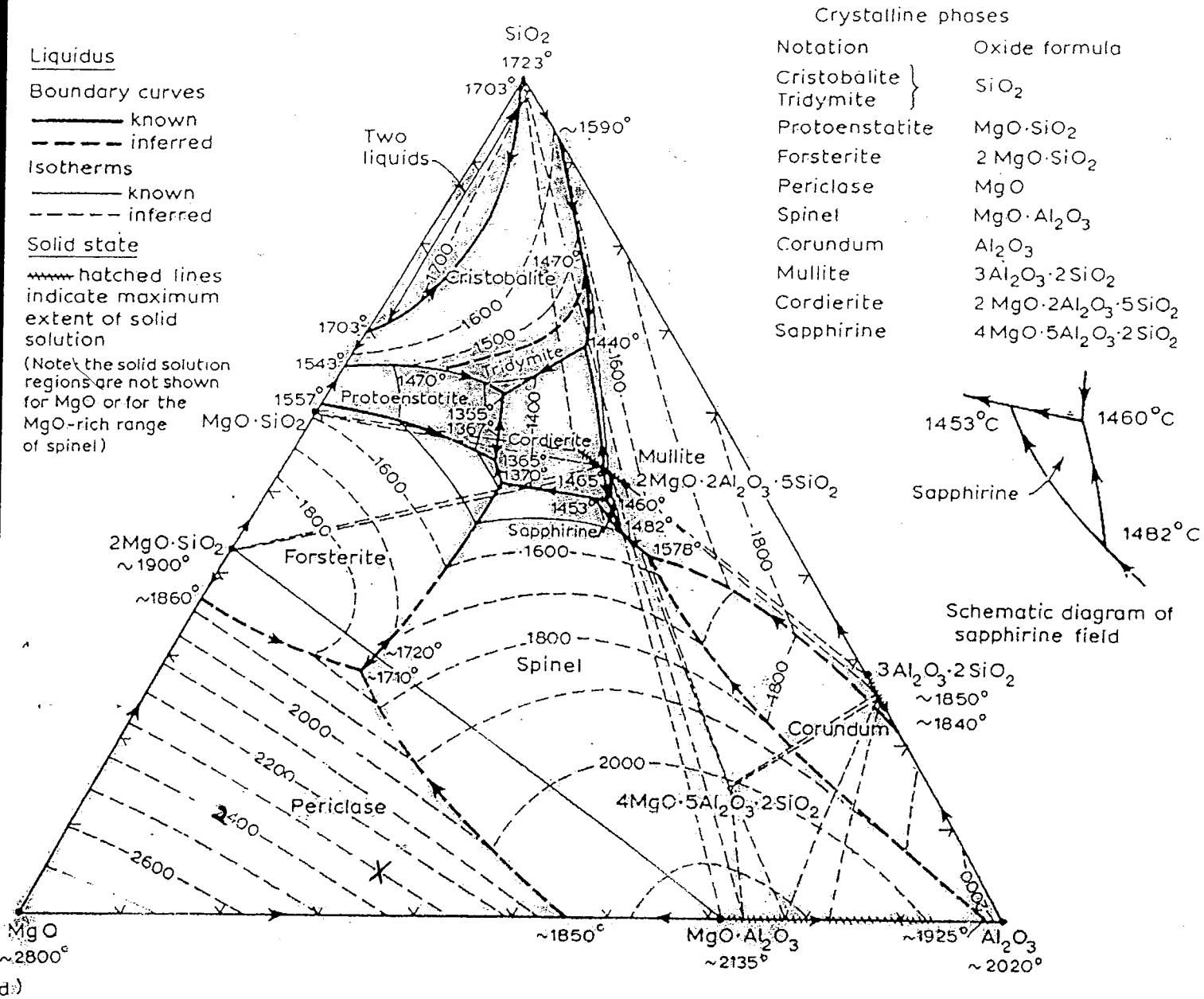
Rajah 1 adalah gambarajah fasa ternari sistem $MgO-Al_2O_3-SiO_2$. Perihalkan penyejukan leburan X dengan merujuk khusus:

(i) apakah komposisi asal X

(ii) apakah suhu bermulanya penghabluran

(iii) apakah fasa hablur pertama yang terhasil

(iv) apakah fasa-fasa mutakhir yang terhasil pada suhu bilik



(40 marks/*markah*)

[b] Glass-ceramic is not just crystallisation in a glass. What is the true meaning of a glass-ceramic material from modern-day perspective?

Seramik kaca bukan sekadar penghabluran dalam kaca. Apakah yang dimaksudkan dengan seramik kaca sebenar?

(20 marks/*markah*)

[c] Describe how you would plan the production of a glass ceramic material consisting mainly of a cordierite crystalline phase. If may be helpful to include the following in your discussion:

(i) the raw materials you would use?

(ii) additive(s) you might add, and why?

(iii) the production schedule/flow chart

(iv) what are the advantages of this type of glass-ceramic?

Perihalkan bagaimana anda merencanakan penghasilan suatu seramik kaca yang mempunyai fasa hablur utama kordierit. Dalam perbincangan anda nyatakan:

(i) apakah bahan mentah yang diperlukan?

(ii) apakah bahan tambah dan kenapa?

(iii) carta alir penghasilan

(iv) apakah kelebihan seramik kaca seumpama ini?

(40 marks/*markah*)

7. [a] Describe Griffith's Theory.

Huraikan tentang Teori Griffith.

(20 marks/*markah*)

[b] Discuss on six (6) factors that influence the actual strength of glasses.

Bincangkan tentang enam (6) faktor yang mempengaruhi kekuatan sebenar bagi kaca.

(40 marks/*markah*)

[c] Cite the chemical properties of glasses and how these properties influence the quality of the glass produced.

Nyatakan sifat-sifat kimia kaca dan bagaimanakah sifat-sifat tersebut mempengaruhi mutu kaca yang dihasilkan.

(40 marks/*markah*)

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